CLAIMS

What is claimed is:

1. A blocked mercaptosilane selected from the group consisting of:

$[[(ROC(=O))_p\text{-}(G)_j]_k\text{-}Y\text{-}S]_r\text{-}G\text{-}(SiX_3)_s$ (1); and

$[(X_3Si)_q\text{-}G]_a\text{-}[Y\text{-}[S\text{-}G\text{-}SiX_3]_b]_c$ (2)

wherein

Y is a polyvalent species $(Q)_zA(=E)$ selected from the group consisting of -C(=NR)-; -SC(=NR)-; -SC(=O)-; -OC(=O)-; -S(=O)-; $-S(=O)_2$-; $-OS(=O)_2$-; $(-NR)S(=O)_2$-; -SS(=O)-; -OS(=O)-; (-NR)S(=O)-; $-SS(=O)_2$-; $(-S)_2P(=O)$-; -(-S)P(=O)-; $-P(=O)(-)_2$; $(-S)_2P(=S)$-; -(-S)P(=S)-; $-P(=S)(-)_2$; $(-NR)_2P(=O)$-; (-NR)(-S)P(=O)-; (-O)(-NR)P(=O)-; (-O)(-S)P(=O)-; $(-O)_2P(=O)$-; -(-O)P(=O)-; -(-NR)P(=O)-; $(-NR)_2P(=S)$-; (-NR)(-S)P(=S)-; (-O)(-NR)P(=S)-; (-O)(-S)P(=S)-; $(-O)_2P(=S)$-; -(-O)P(=S)-; and -(-NR)P(=S)-; wherein the atom A attached to unsaturated heteroatom E is attached to the sulfur which in turn is linked via a group G to the silicon atom;

each R is chosen independently from hydrogen, straight, cyclic, or branched alkyl that may or may not contain unsaturation, alkenyl groups, aryl groups, and aralkyl groups, with each R containing from 1 to 18 carbon atoms;

each G is independently a monovalent or polyvalent group derived by substitution of alkyl, alkenyl, aryl, or aralkyl, wherein G can contain from 1 to 18 carbon atoms, and if G is univalent, G can be a hydrogen atom;

X is independently selected from the group consisting of -Cl, -Br, RO-, RC(=O)O-, $R_2C{=}NO$-, R_2NO-, R_2N-, -R, and $-(OSiR_2)_t(OSiR_3)$ wherein each R is as above and at least one X is not -R;

p is 0 to 5; r is 1 to 3; z is 0 to 2; q is 0 to 6; a is 0 to 7; b is 1 to 3; j is 0 to 1, but it may be 0 only if p is 1; c is 1 to 6; t is 0 to 5; s is 1 to 3; k is 1 to 2; with the provisos that (I) if A is carbon, sulfur or sulfonyl, then (i) a + b is 2 and (ii) k is 1; (II) if A is phosphorus, then a + b is 3 unless both (i) c is greater than 1 and (ii) b is 1, in which case a is c + 1; and (III) if A is phosphorus, then k is 2.

2. A blocked mercaptosilane according to claim 1 wherein R is selected from the group consisting of methyl, ethyl, propyl, isobutyl, phenyl, tolyl, phenethyl, norbornyl, norbornenyl, ethylnorbornyl, ethylnorbornenyl, ethylcyclohexyl, ethylcyclohexenyl, and cyclohexylcyclohexyl.

3. A blocked mercaptosilane according to claim 1 according to formula (I).

4. A blocked mercaptosilane according to claim 1 according for formula (II).

5. A blocked mercaptosilane according to claim 1 which has been partially hydrolyzed.

6. A blocked mercaptosilane according to claim 1 wherein Y is selected from the group consisting of: -OC(=O)-; -SC(=O)-; -S(=O)-; -OS(=O)-; -(-S)P(=O)-; and $-P(=O)(-)_2$.

7. The blocked mercaptosilane of claim 1 wherein Y is selected from the group consisting of -C(=NR)- and -SC(=NR)-.

8. The blocked mercaptosilane of claim 1 wherein Y is selected from the group consisting of $-S(=O)_2-$; $-OS(=O)_2-$; $(-NR)S(=O)_2-$; $-SS(=O)-$; $(-NR)S(=O)-$; and $-SS(=O)_2-$.

9. The blocked mercaptosilane of claim 1 wherein Y is selected from the group consisting of $(-S)_2P(=O)-$; $(-S)_2P(=S)-$; $-(-S)P(=S)-$; $-P(=S)(-)_2$; $(-NR)_2P(=O)-$; $(-NR)(-S)P(=O)-$; $(-O)(-NR)P(=O)-$; $(-O)(-S)P(=O)-$; $(-O)_2P(=O)-$; $-(-O)P(=O)-$; $-(-NR)P(=O)-$; $(-NR)_2P(=S)-$; $(-NR)(-S)P(=S)-$; $(-O)(-NR)P(=S)-$; $(-O)(-S)P(=S)-$; $(-O)_2P(=S)-$; $-(-O)P(=S)-$; and $-(-NR)P(=S)-$.

10. A blocked mercaptosilane according to claim 1 wherein the sum of the carbon atoms within the G groups within the molecule is from 3 to 18.

11. A blocked mercaptosilane according to claim 1 wherein X is selected from the group consisting of methoxy, ethoxy, isobutoxy, propoxy, isopropoxy, acetoxy, and oximato.

12. A blocked mercaptosilane according to claim 1 wherein p is 0 to 2; X is RO- or $RC(=O)O-$; R is selected from the group consisting of hydrogen, phenyl, isopropyl, cyclohexyl, isobutyl; and G is a substituted phenyl or substituted straight chain alkyl of C_2 to C_{12}.

13. A blocked mercaptosilane of the formula: $X_3SiGSC(=O)GC(=O)SGSiX_3$ wherein

each R is chosen independently from hydrogen, straight, cyclic, or branched alkyl that may or may not contain unsaturation, alkenyl groups, aryl groups, and aralkyl groups, with each R containing from 1 to 18 carbon atoms;

each G is independently a divalent group derived by substitution of alkyl, alkenyl, aryl, or aralkyl, wherein G can contain from 1 to 18 carbon atoms, with the proviso that G is not such that the blocked mercaptosilane would contain an α,β-unsaturated carbonyl including a carbon-carbon double bond next to the thiocarbonyl group;

X is independently selected from the group consisting of -Cl, -Br, RO-, RC(=O)O-, R_2C=NO-, R_2NO-, R_2N-, -R, and $-(OSiR_2)_t(OSiR_3)$ wherein each R is as above and at least one X is not -R; and

t is 0 to 5.

14. A blocked mercaptosilane selected from the group consisting of:

$[[(ROC(=O))_p-(G)_j]_k-Y-S]_r-G-(SiX_3)_s$ (1); and

$[(X_3Si)_q-G]_a-[Y-[S-G-SiX_3]_b]_c$ (2)

wherein

Y is a -C(=O)-;

each R is chosen independently from hydrogen, straight, cyclic, or branched alkyl that may or may not contain unsaturation, alkenyl groups, aryl groups, and aralkyl groups, with each R containing from 1 to 18 carbon atoms;

each G is independently a monovalent or polyvalent group derived by substitution of alkyl, alkenyl, aryl, or aralkyl, wherein G can contain from 1 to 18 carbon atoms, with the

proviso that G is not such that the blocked mercaptosilane would contain an α,β-unsaturated carbonyl including a carbon-carbon double bond that can undergo polymerization reactions next to the thiocarbonyl group;

X is independently selected from the group consisting of -Cl, -Br, RO-, RC(=O)O-, $R_2C{=}NO$-, R_2NO-, R_2N-, -R, and $-(OSiR_2)_t(OSiR_3)$, wherein each R is as above and at least one X is not -R; and

p is 0 to 5; r is 1 to 3; q is 0 to 6; a is 0 to 1; b is 1 to 2; j is 1; c is 1 to 6; t is 0 to 5; s is 1 to 3; k is 1; and a + b is 2.

15. The blocked mercaptosilane of claim 14 wherein p is 2 to 5.

16. The blocked mercaptosilane of claim 14 wherein G, which is directly bonded to Y, is alkyl of from two to twelve carbon atoms.

17. The blocked mercaptosilane of claim 14 wherein G, which is directly bonded to Y, is alkyl of from six to eight carbon atoms.

18. The blocked mercaptosilane of claim 14 wherein R is hydrogen or an alkyl having from one to four carbon atoms.

19. The blocked mercaptosilane of claim 14 which has been partially hydrolyzed.

20. The blocked mercaptosilane of claim 14 wherein X is selected from the group consisting of methoxy, ethoxy, isobutoxy, propoxy, isopropoxy, acetoxy, and oximato.

21. The blocked mercaptosilane of claim 14 wherein X is RO- or RC(=O)O-.

22. The blocked mercaptosilane of claim 14 wherein R is hydrogen or an alkyl having from one to four carbon atoms and G, which is directly bonded to Y, is alkyl of from two to twelve carbon atoms.

23. The blocked mercaptosilane of claim 14 wherein R is hydrogen or an alkyl having from one to four carbon atoms and G, which is directly bonded to Y, is alkyl of from six to eight carbon atoms.

24. The blocked mercaptosilane of claim 14 which is 3-triethoxysilyl-1-propylthiooctanoate.

25. A composition consisting essentially of a carrier and a blocked mercaptosilane selected from the group consisting of:

$$[[(ROC(=O))_p\text{-}(G)_j]_k\text{-}Y\text{-}S]_r\text{-}G\text{-}(SiX_3)_s \qquad (1);\text{ and}$$

$$[(X_3Si)_q\text{-}G]_a\text{-}[Y\text{-}[S\text{-}G\text{-}SiX_3]_b]_c \qquad (2)$$

wherein

Y is a polyvalent species $(Q)_zA(=E)$, wherein A attached to the unsaturated heteroatom E is attached to the sulfur, which in turn is linked via a group G to the silicon

atom;

each R is chosen independently from hydrogen, straight, cyclic or branched alkyl that may or may not contain unsaturation, alkenyl groups, aryl groups, and aralkyl groups, with each R containing from 1 to 18 carbon atoms;

each G is independently a monovalent or polyvalent group derived by substitution of alkyl, alkenyl, aryl or aralkyl wherein G can contain from 1 to 18 carbon atoms, with the proviso that if Y is -C(=O)-, G is not such that the blocked mercaptosilane would contain an α,β-unsaturated carbonyl, and if G is univalent, G can be a hydrogen atom;

X is independently a group selected from the group consisting of -Cl, -Br, RO-, RC(=O)O-, $R_2C{=}NO$-, R_2NO-, R_2N-, -R, and $-(OSiR_2)_t(OSiR_3)$ wherein each R is as above and at least one X is not -R;

Q is oxygen, sulfur or (-NR-);

A is carbon, sulfur, phosphorus, or sulfonyl;

E is oxygen, sulfur or NR;

p is 0 to 5; r is 1 to 3; z is 0 to 2; q is 0 to 6; a is 0 to 7; b is 1 to 3; j is 0 to 1, but it may be 0 only if p is 1, c is 1 to 6, t is 0 to 5; s is 1 to 3; k is 1 to 2, with the provisos that (A) if A is carbon, sulfur or sulfonyl, then (i) a + b = 2 and (ii) k = 1; (B) if A is phosphorus, then a + b = 3 unless both (i) c is greater than 1 and (ii) b is 1, in which case a is c + 1; and (C) if A is phosphorus, then k is 2.

26. The composition of claim 25 wherein the carrier is a filler.

27. The composition of claim 26 wherein the filler is selected from the group consisting of silica and carbon black.

28. The composition of Claim 25 wherein Y is selected from the group consisting of -C(=NR)-; -SC(=NR)-; -C(=O)-; -SC(=O)-; -OC(=O)-; -S(=O)-; -$S(=O)_2$-; -$OS(=O)_2$-; (-NR)$S(=O)_2$-; -SS(=O)-; -OS(=O)-; (-NR)S(=O)-; -$SS(=O)_2$-; $(-S)_2P(=O)$-; -(-S)P(=O)-; -$P(=O)(-)_2$; $(-S)_2P(=S)$-; -(-S)P(=S)-; -$P(=S)(-)_2$; $(-NR)_2P(=O)$-; (-NR)(-S)P(=O)-; (-O)(-NR)P(=O)-; (-O)(-S)P(=O)-; $(-O)_2P(=O)$-; -(-O)P(=O)-; -(-NR)P(=O)-; $(-NR)_2P(=S)$-; (-NR)(-S)P(=S)-; (-O)(-NR)P(=S)-; (-O)(-S)P(=S)-; $(-O)_2P(=S)$-; -(-O)P(=S)-; and -(-NR)P(=S)-.

29. The composition of Claim 25 wherein Y is -C(=O)-.

30. The composition of claim 26 which is the reaction product of the filler and the blocked mercaptosilane.

31. The composition of claim 30 wherein the filler and blocked mercaptosilane are reacted through the SiX_3 group of the blocked mercaptosilane.

32. The composition of claim 25 wherein the carrier is a porous polymer.